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NATIONAL CANNERS ASSOCIATION

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Raw Products Research Activities

New York State Station Reports High Level of Farmer Participation in Research

While it is customary for various State agricultural organizations and certain farmer groups to meet at the New York State Agricultural Experiment Station for the purpose of examining experimental plats or for conferences on matters of especial interest to each, the number that did so during 1940-41 was larger than usual, according to the latest report of the station. In addition, two joint committees representing respectively the fruit and vegetable interests of the State, in association with representatives of different county farm bureaus, met to review the research programs relative to these two fields of endeavor. The efforts of these committees show that research has become an important interest to farmers. Their concern is not simply that of obtaining the latest information and advice, but also embraces independent action by organized farmer groups to review critically the research programs and facilities to bring about effective prosecution of the work.

For many years the Geneva Station has devoted special attention to canning crops problems, with men in vegetable crops, entomology, and plant pathology giving full time to research in their respective fields as they affect these problems. The results of this work through the years have been of incalculable value to both growers and canners in New York State. Some recent "high spots" are touched on in the following paragraphs from the 60th Annual Report of the Station.

Pea aphid

Extensive studies have been made of various insecticides for the control of pea aphid. At present both nicotine and rotenone have proved to be most effective. Much attention has been given to the devising of a machine for atomizing oil sprays and water sprays containing either toxicant. The machine now has been perfected sufficiently to make possible a thorough application using only four or five gallons of oil or 25 gallons of water per acre. This is in marked contrast to the standard spray equipment using from 125 to 150 gallons of water containing the insecticide per acre. Not only is the cost of providing this great volume of water largely avoided, but the equipment is simpler and lighter and the speed of application greater. Much work has been done with a vaporizer for nicotine whereby the use of oil or water is avoided.

Pea diseases

Seed treatment tests with peas conducted with several copper, organic mercury, and organic compounds showed that both early and late peas were benefited by treatment. In half-acre plots placed on different farms in western New York the treated seed produced 200 to 1,800 pounds more shelled peas per acre than untreated seed planted alongside. According to the yields obtained, the best materials tested were Spergon at one to two ounces per bushel, Cuprocide at 2½ ounces, and Semesan at 2½ ounces. These materials and New Improved Ceresan at one ounce were equally satisfactory as seed protectants, but the Ceresan consistently retarded growth and reduced the yield per plant. Cuprocide caused moderate injury in at least two fields.

Although pea foot-rot and root-rot were widespread during the moist growing season of 1940, average yields for that year were some 400 pounds over that of the past 10 years. Presumably the cool, moist weather permitted maturity of diseased plants which, under drier conditions, would have dried up prematurely.

None of the 35 supposedly resistant selections from commercial lots of seed proved resistant to root-rot when planted in a severely infested plot of ground.

Pea fertilizers

As in the past five years, drilling fertilizer separate from peas greatly increased the yield. The best yields were obtained where the fertilizer was applied with a combination drill which applied the fertilizer in bands two inches to the side of the pea seed and about four inches deep. The next best method was to drill the fertilizer in deeply and then drill the seed separately at a depth of about 1½ to two inches. Drilling the fertilizer in contact with the seed, particularly if the fertilizers contain nitrogen and potash, greatly reduces the germination of the seed and usually results in a reduced yield. It is better not to apply fertilizer at all than to apply it so that it will cause injury to the seed.

European corn borer and corn ear worm

The two dusts that show the most promise on corn borer are a dual-fixed nicotine and powdered derris root mixed with pyrophyllite. Much attention has been devoted to the designing of machines that will apply the material on corn.

For control of corn ear worm a special, highly refined lubricating oil has proved very effective. This oil is even more effective when it contains either rotenone or pyrethrum extract. A few centimeters of the oil are applied to the silk by means of a specially designed piece of apparatus. This method of treatment is practical in the eastern part of the State where fresh sweet corn is sold in the markets, but probably would be too expensive for sweet corn grown for canning factory use.

Effect of beets on sweet corn

Investigations of the detrimental effect of beets on a succeeding crop of sweet corn indicate that the reduction of yield in corn is due largely to a heavy draft by the beets on the available supply of certain nutrients, particularly potash in the soil. Following beets the yield of corn was significantly increased by the application of a complete fertilizer high in potash.

Fertilizers for beets

In experiments at Geneva, at Flint, and at two points in the Genesee Valley, in which three different levels of nitrogen, potash, and boron were compared, the best results were obtained when 45 pounds of N, 60 pounds of K_2O, and 30 pounds of borax were applied per acre. Beets require a liberal supply of nitrogen, phosphorus, potash, and boron to produce large yields. The growing crop often indicates certain soil deficiencies. For example, maroon-colored foliage is an indication of lack of available nitrogen and fields showing this character should be promptly side-dressed with a soluble nitrogen fertilizer. A drying up of the growing point is an indication of lack of sufficient boron. These symptoms are described in Cornell Bulletin No. 752.

Sweet corn varieties

Among the new yellow sweet corn hybrids, Sachem proved to be exceptionally uniform in plant and ear characteristics. It matured about four days earlier than Golden Cross, was predominantly 12-rowed and deep kerneled, possessed the excellent flavor of the original Golden Bantam, and had a distinctly tender pericarp.

Tomato diseases

Tomato leaf blight was adequately controlled by spraying with Bordeaux mixture 4-2-50, copper oxychloride sulfate, Grasselli Compound A, Cuprocide 54-Y, yellow Cuprocide, and Tennessee tribasic. Tests on half-acre blocks in commercial fields showed that the gross return from spraying amounted to from $13 to $54 an acre. These figures were computed from fruit delivered to canning factories and graded by the official inspector, and were based on relatively low prices per ton for the raw product. With higher contract prices, these figures would be increased accordingly, thereby making it even more profitable to spray.

Dusts gave very good control of leaf blight where mixtures containing six per cent copper in talc and flour were applied with a row-crop duster. Control was essentially the same where Cuprocide, copper oxychloride sulfate, Grasselli Compound A, and Tennessee 34 were used. In one test where sprays and dusts were applied in the same field two applications of yellow Cuprocide gave about the same degree of control as four applications of Cuprocide dust at either six or 10 per cent metallic copper content.

Tomato varieties

To test the leading varieties of tomatoes, trials of canning varieties, early varieties, yellow-fruited sorts, and Italian-type tomatoes were grown and yields and seasonal records obtained. The yields of 15 varieties of canning tomatoes showed that Nystate, Geneva John Baer, Stokesdale, and Early Baltimore gave the best early and total yields. About 75 per cent of the yields of these varieties are obtained previous to September 15. The varieties Marglobe and Rutgers are much later in season and produced from 40 to 60 per cent of the fruit after September 15. The four-year average of the yields of these varieties showed that the varieties Nystate, Geneva John Baer, Stokesdale, and John Baer produced from 25 to 35 per cent higher yields than Marglobe or Rutgers.

For early fruits, the new varieties Victor, Bounty and Valiant proved promising. Plants of these varieties can be set two by three feet or three by three feet and produce a good crown set which ripens early. The yellow varieties Mingold and Golden Globe gave better fruits and greater yields than the old standard variety Golden Queen.

Tomato fertilizers

With nitrogen and phosphorus applied for tomatoes at uniform rates (30 pounds N and 120 pounds P_2O_5 per acre), increasing the amount of potash in the fertilizer from 30 to 60 and to 120 pounds of K_2O per acre resulted in progressive slight, but not significant decreases in both early and total yields. At the highest rate of potash application (120 pounds K_2O with 120 pounds P_2O_5 and 30 pounds N), the plants appeared starved for nitrogen. The foliage was distinctly yellow and tissue tests showed it to be lacking in nitrates. Apparently, the large proportion of potash to nitrogen (four to one) inhibited the uptake of nitrogen, probably due to the greater activity of the potassium ion. This same effect has been observed on other crops and other soils. Undoubtedly the correct balance between nitrogen and potash is of great importance in determining their effectiveness. For example, when the nitrogen and potash were both increased from 30 pounds to 60 pounds per acre, the yield of tomatoes was substantially increased (over 2¼ tons gain per acre), whereas increasing the K_2O to 60 pounds while the N remained at 30 pounds resulted in a decrease in yield.

Methods of applying tomato fertilizer

Comparisons were made of the same amounts of fertilizer applied as follows: (1) Disced and harrowed in thoroughly; (2) drilled deeply and not disturbed; (3) applied in deep bands to the side of the row; (4) one third of the fertilizer applied in bands and two thirds plowed under; (5) all the fertilizer plowed under; (6) applied in solution. The best results were obtained where the larger portion of the fertilizer was plowed under and a small amount applied in bands at the time of planting. The most economical gain, however, was obtained where the small amount was applied in bands. Large amounts in bands proved toxic. The least effective method was applying the fertilizer broadcast and discing and harrowing it through the soil. Apparently this caused a rapid fixation of the phosphorus in the soil in an unavailable form and greatly reduced the effectiveness of the fertilizer as well as increasing the amount of work required. Applying the fertilizers in solution in successive applications did not give as large yields as plowing under the same amount of fertilizer before planting. The solution applications required special equipment, a large amount of water, and considerable extra labor.

Plowing under fertilizer has been recommended as a means of increasing the effectiveness of fertilizers in dry periods. It is interesting to note that the rainfall was exceedingly heavy at the time these crops (tomatoes and cabbage) were planted and that the large yields obtained from the plowed under

fertilizers, even under these conditions, would indicate that it would be an effective method both in wet seasons and dry seasons. The results of the experiment with tomatoes have been published in Farm Research (Vol. VII, No. 3).

Starter solutions for tomatoes

For the fourth successive year very marked increase in yields and earliness of tomatoes have been obtained by the use of starter solutions applied at the time the tomatoes are transplanted. By a starter solution is meant a complete fertilizer in solution which is poured around the roots of the plant at the time it is transplanted or on the seed row of seed sown crops. Starter solutions are particularly effective with plants which have been grown under rather low nutritional conditions.

Of the large number of formulas which have been tried out, three have proved particularly effective. The results of the tests have been published in Farm Research (Vol. VII, No. 2).

Bean diseases

Five lines of mosaic-resistant hybrid Refugee beans produced at the station were tested alongside U. S. No. 5 and Idaho Refugee in replicated plots at Geneva. Three of the hybrids yielded more snap beans than either U. S. No. 5 or Idaho Refugee, but only one of these had desirable canning qualities.

Mosaic tests with Idaho Refugee and U. S. No. 5 in 1940 again revealed the high degree of common mosaic resistance shown the previous year in plantings from commercial seed stock. Tests with Low's Champion, Giant Stringless Green Pod, Asgrow Stringless Green Pod, Keeney's Stringless Green Refugee, various strains of Stringless Green Refugee, and Commodore showed from 72 to 100 per cent common mosaic.

Bean breeding

A total of 40 strains or varieties of canning beans were grown in trial plats. In the group which included the standard canning beans, all of the stocks of regular stringless greenpod Refugee showed severe mosaic infestation. Idaho Mosaic-resistant Refugee and U. S. No. 5 were mosaic resistant and produced on the average four times the yield of regular Refugee. In a group of hybrids, two stocks from a commercial seed grower proved to be mosaic-resistant and produced high yields.

In canning tests, the color and quality of U. S. No. 5 and the new hybrid known as Sensation were equal to or better than regular Refugee. The bean canners in rating the canned samples indicated a preference for a bean darker in color than any which were grown in the 1940 trials.

In cooperation with the Bean Committee of the Association of New York State Canners, the U. S. Department of Agriculture, and a number of seedsmen, a New York Bean Improvement Program has been initiated. This program is to include tests of existing and new hybrid material to be grown at the Experiment Station in order to hasten the development of bean varieties better adapted to New York conditions.

Pole beans

A trial of pole beans included three stocks of Blue Lake. Pole beans long have been grown in home and farm gardens in New York, but because the picking season extends into September and therefore presents a harvesting problem and conflicts in season with other canning crops, the bush types have become standard for canning. Blue Lake, however, has pods which for length, color, straightness, and quality are considered more promising than Refugee. The yields in the 1940 trials at Geneva were 50 per cent higher than for Refugee.

Edible soybeans

A test was made of six varieties of edible soybeans harvested at both the green shell and the dry seed stage. The green shell beans were threshed in a commercial pea viner and were canned under commercial canning conditions. Tests also were made of quick freezing preservation of these varieties. Of the varieties in this test, Giant Green matured two weeks earlier than the other varieties and produced the largest yield. It also produced a product of excellent quality both for canning and for freezing. Willomi also produced a high quality pack but was so late in maturing that it is doubtful if it would be of commercial value in New York State. Giant Green, however, offers distinct commercial possibilities whenever this delicious vegetable attains popularity.

Lima bean diseases

Lima bean mosaic was severe in plantings of strains of Early Baby Potato, Baby Potato, Baby Fordhook, U. S. No. 2, Green-seeded Henderson, Illinois Large-podded, and Henderson bush lima. The large Fordhook type showed no disease.

Lima bean seed treatment

In an effort to find a more suitable material for use as a protectant for lima bean seed a number of new materials were tried during the season. Work was continued with Spergon and New Improved Semesan Jr. The results were somewhat erratic, but on the whole there was some increase in stand due to treatment with both of the materials mentioned. Wherever possible, yield data were taken, but the increased stands due to treatment were not reflected in increased yields. In some cases downy mildew caused so much injury that the data were useless. The problem was further aggravated by seed injury caused by the seed corn maggot and other insects.

Spraying and dusting lima beans

Spraying and dusting experiments with lima beans were carried on to compare the value of Bordo mixture and copper-lime dust, now commonly used on Long Island, with certain of the insoluble copper compounds now on the market. Under Long Island conditions diaporthe pod-spot and downy mildew are the two diseases against which fungicides are commonly applied to lima beans. The value in controlling these diseases was studied, together with foliage and blossom injury.

Certain insoluble copper compounds, at the strength used as a spray, caused market stunting and foliage injury. This also was true where a 4-2-50 Bordo was used.

Spraying and dusting was done on a regular schedule with no regard for the blooming period. Data taken on set during the season showed that, in all cases, the set of beans was greater on treated than on untreated plats. This was true of both sprays and dusts and with all of the materials used.

All forms of the copper used, both as sprays and dusts, gave commercial control of downy mildew. None of the in-

soluble coppers proved to be superior to Bordo 4-4-50 in the control of mildew.

The most promising dust proved to be one composed of Cuprocide GA, sulfur, derris, and pyrophillite. In addition to controlling mildew this dust gave good control of red spider and the Mexican bean beetle.

PEA VARIETIES

Several new pea varieties for canning and freezing were included in the 1940 trials. The new canning pea variety Wisconsin Merit has been the most heat-tolerant of any late pea yet observed. It has usually exceeded Perfection in yield, although it has been considered rather variable in berry color by some canners.

Reference: Sixtieth Annual Report, New York State Agricultural Experiment Station, Geneva.

Ascorbic Acid Content of Florida Grapefruit

The results of an investigation made to determine the ascorbic acid content of the juice of Florida grapefruit and to determine whether such content is influenced by rootstocks, variety, and the position of the fruit on the tree (outside or exposed fruit compared with inside or shaded fruit) are reported in a recent issue of the Journal of Agricultural Research. The ascorbic acid concentration was determined for 390 individual grapefruits picked from outside and inside branches of five trees each of Marsh grapefruit grown on rough lemon rootstock, of Marsh grapefruit grown on sour orange rootstock, and of Foster (pink) grapefruit grown on sour orange rootstock.

The results showed that Florida grapefruit from various sources has high antiscorbutic properties. In this experiment the average ascorbic acid concentration was 0.40 milligram per milliliter of grapefruit juice.

A relatively small but consistent difference was found in the ascorbic acid concentration in fruits obtained from outside and inside branches from the three sources; the outside fruit had the higher ascorbic acid concentration. This difference was found to be significant at the one per cent level.

It also was found that the pink variety (Foster) had a significantly higher ascorbic acid content in the juice than Marsh when both were grown on sour orange rootstock.

Reference: "Relation of Ascorbic Acid Concentration in Juice of Florida Grapefruit to Variety, Rootstock, and Position of Fruit on the Tree." Journal of Agricultural Research, January 1, 1942.

Status of the European Corn Borer in 1941

A detailed account of the spread of the European corn borer during 1941 into new territory is presented in a supplement to the Insect Pest Survey Bulletin, recently released by the U. S. Department of Agriculture. The relative abundance of the borer in the fall of 1941 was determined for a considerable portion of the infested area, and compared with data for 1940, by counties in the States surveyed. Counties of infested States in which the European corn borer was found for the first time in 1941 are listed also.

Reference: Insect Pest Survey Bulletin, Supplement to No. 9, Nov. 8, 1941. Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture. Copies available to members on request to the Raw Products Bureau.

Washington State Crop and Soil Studies Conducted by Central and Four Branch Stations

Four branch stations, of the Washington Agricultural Experiment Station, established for work on problems which, by reason of soil types, distinct climate, or special crops, are peculiar to a locality and must be studied where they occur, supplement work done at the central headquarters station at Pullman. The Adams Branch Station at Lind represents an area with a rainfall of between eight and 15 inches that is "dry farmed," a section of between three and four million acres of land which never will be irrigated. The Irrigation Branch Station contributes greatly to the solution of agricultural problems on the 500,000 acres of irrigated land in Washington and has accumulated information of value to the agriculture which will be established on the projects soon to be irrigated. The Tree Fruit Branch Station helps with the many difficult problems of the tree fruit industry. The Cranberry-Blueberry Laboratory at Long Beach has been instrumental in developing more effective and less costly methods of controlling the insect pests of the cranberry; has assembled information on varieties that has led to the discarding of inferior varieties; and has demonstrated the practicability of sprinkling irrigation for protection against frost and other helpful management practices. The projects reported below are of particular interest to canners.

PEAR PSYLLA

The destructive pear psylla was first discovered in Spokane County in 1939 and was believed to be limited to a comparatively small area in eastern Washington and northern Idaho. The U. S. Department of Agriculture, after consultation with the State agencies, initiated an eradication and control program including the removal of infested pear trees where possible and the spraying of orchards where it was believed this would be an effective control.

Unfortunately, the pear psylla infestation was found to be more widespread than was originally anticipated, the insect having been discovered in several counties of eastern Washington and in Chelan and Okanogan counties. Thus far, it has not invaded the more intensive pear-producing areas in the State and Federal and State agencies are doing everything possible to handle the situation within the means available.

TOMATO FRUIT WORM CONTROL

An undusted block of tomatoes at the Irrigation Branch Station showed a total of 8 per cent damaged fruits at the end of the picking season. Damage was most noticeable at the start of the season or up to the middle of August. Natural cryolite and calcium arsenate with equal quantities of diatomaceous earth were applied to one-seventh acre blocks at the rate of about 40 pounds and 30 pounds per acre, respectively. Two applications were made two weeks apart. The last dust was applied two weeks before harvest started. Cryolite reduced damage to 3½ per cent and calcium arsenate reduced damage to 2½ per cent.

TOMATO VARIETY TRIALS

Studies in Spokane County with 18 varieties of tomatoes showed Morse's Special Early, Gill's Selected Earliana, Nystate, Ventura, Wasatch Beauty, Bonny Best, Pritchard, Stokesdale and Lange's Earliana in the order listed to be

the most promising varieties based on total marketable fruits produced. From the standpoint of earliness of production, Avon Early, Marketeer, Lange's Earliana, Gill's Selected Earliana, Valiant, Master Marglobe, Morse's Special Early, and Bonny Best were most promising. The tomato varieties most free from cracks were Wasatch Beauty and Improved Pearson.

At the Irrigation Branch Station, Bonny Best was grown in seeded and transplanted plots. The seeded tomatoes yielded a normal crop but the curly-top virus took a heavy toll of the transplanted tomatoes. Artichokes grown as a hedge gave some beneficial protection against the curly-top disease but would be more valuable if their growth were made earlier in the season. Curly-top was not generally serious that season in the Yakima Valley.

Asparagus insects

The season's work on asparagus beetle was devoted largely to a study of the life cycle and habits of the insect in relation to the development of the crop in order to time control measures properly.

Beetles began emerging from hibernation in April. This corresponded with the appearance of the asparagus spears. The first brood fed mostly upon volunteer asparagus which abounds along fence rows, roadsides, and ditch banks, or upon seedlings and newly set plants which were not cut. Very few eggs were deposited on cutting shoots. The insect-feeding injury on these shoots, which amounted to as much as 20 per cent in some fields, usually was traced to cutworms.

Near the end of the cutting season the first brood had completed its development. Beetles emerged from the soil in June and deposited eggs on the main crop which was growing up to succulent foliage. Soon after attaining growth the asparagus bloomed and honey bees flocked to the fields during the flowering period. Insecticides applied at this time for beetle control would result in severe bee poisoning. Applications could be made either before or after blooming with very little loss of efficiency. Later mature stalks were practically uninfested. The beetles preferred to feed and deposit eggs on succulent stalks which developed throughout the season.

Asparagus varieties

Varieties planted in 1938 were cut for the first time in 1940. In order of yield, they were Mary Washington, Paradise, Palmetto and Giant Mary Washington. Plants of the Mary Washington variety were segregated into staminate and pistillate plants to determine their production. Staminate plants set out in 1938 and first cut in 1940 outyielded pistillate plants receiving the same treatment by 23,671 spears and 1660 pounds per acre.

Asparagus diseases

An unusual occurrence of asparagus rust was noted at Kennewick, Prosser and Sunnyside, reaching its greatest severity in the Sunnyside area. Ideal conditions for rust infection prevailed in September and early October, and the disease was abundant on the Martha Washington variety, usually regarded as rust-resistant. Fusarium root rot and wilt of asparagus has attracted the interest of growers in this area for several years, and is the subject of special study in the Division of Plant Pathology.

Pea varieties

Of the varieties tested, Thomas Laxton was one of the earliest and produced the largest yield at the first picking. From planting to first picking required 62 days. Those varieties that gave comparatively high yields were Hundredfold, Improved Gradus, Laxton's Progress, Blue Bantam and Gilbo, the last being late coming into bearing.

Bean rust

Breeding experiments for the control of bean rust were postponed pending results of tests with crosses made by a commercial seed company. These crosses showed promise of rust-resistance coupled with other desirable qualities. Definite conclusions concerning the value of these hybrids await more extensive plantings. Further survey of the distribution of bean rust indicates that the disease is restricted primarily to the Whatcom County district.

Bean varieties

Green snap bean varieties being developed by the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, USDA, for their resistance to the curly-top virus were tested. Selections 7907 (Mackie—Burtner x Idaho Refugee) and 7898 (Mackie—Burtner x Blue Lake) were compared with Blue Lake. Both selections were highly resistant to the curly-top disease and appeared to have comparable culinary qualities to those of Blue Lake.

Lima bean varieties

Twelve varieties and strains of lima beans were tested. Yields of the different varieties were greatly affected by the amount of growth made by the plant and the weather conditions that existed during the blossoming period. Weather conditions during the experiment were more favorable for Fordhook production. Promising varieties from this year's trials were Fordhook, Baby Fordhook, Baby Potato and Henderson Bush.

Soybean varieties

Edible soybean varieties were grown for the first time. The varieties in order of their yields were Bansei, Toku, Giant Green and Jogun, with Bansei yielding 2190 pounds of green beans per acre.

Sweet corn varieties

Sweet corn variety work has been limited mainly to those varieties that show considerable natural resistance to corn earworm injury. The following varieties were promising for their corn earworm resistance: Ioglen, Golden Cross Bantam, Iogold A, Kancross and C87 x P39. The highest yielding varieties were C87 x P39, Golden Cross Bantam, Carmelcross P39.C13, Goldencross C31.P51 and Ioglen.

Cranberry-blueberry studies

The laboratory at Long Beach has conducted studies on irrigation, dormant sprays, fireworm sprays, use of fungicides for control of field and storage rots, and use of sprinklers to prevent frost damage.

Reference: Fiftieth Annual Report, State College of Washington Agricultural Experiment Station, Pullman.

Georgia Coastal Station Makes Extensive Study of Tomato Seedling Blight Control

In the field of horticulture, studies are being made at the Georgia Coastal Plain Experiment Station of the principal fruit and vegetable crops. The Coastal Plain is noted for its heavy production of a number of truck crops, including sweet potatoes, cabbage, tomatoes, lima beans, etc. While the sandy loam soils and mild climate favor growth of these crops, diseases and insects take severe toll if not controlled and involve problems which must receive attention in the Experiment Station's research program.

Tomato seedling disease control

Of particular interest to canners is the cooperative research program which has been undertaken at this station in the effort to find methods for controlling early blight (stem canker or collar rot) of seedling tomatoes, a disease which has caused heavy annual losses to growers of tomato plants for northern shipping, an industry which is reaching large proportions in Georgia. While considerable progress has been made with some of the field phases of the problem, there still are numerous unsolved disease factors in need of investigation. The whole field of plant transportation and storage in relation to disease must be explored. In this there are many complicated angles of both plant physiology and engineering that have an important bearing upon disease-development.

Dissemination of early blight

From the standpoint of the commercial plant grower, the early blight or *M. solani* disease of tomato seedlings is of greatest economic importance. This fungus parasite produces spots on the leaves and cankers on the stems, the latter being of serious concern in that it often causes poor field stands through the breaking off of young plants following transplanting. One of the primary steps in the control of this disease was to determine its mode of dissemination and actual distribution over the plant-growing area of Georgia. Through the use of both spore traps and composite soil samples, such studies have been made during the past three seasons. The results of this work indicate that the disease may be widely disseminated through the air and that its distribution is such that it may appear in any field throughout the plant-growing area provided sufficient humidity and favorable temperature conditions prevail for infection to take place. These findings bring forward the question of the volume of crop-rotation as a step in the control of this disease. Unquestionably, rotation would tend to minimize a heavy spore load in any particular field and would reduce infection correspondingly. However, since the causal organism is so widely distributed in all fields, crop-rotations, even though a desirable and an advisable practice, should not be depended upon as a major means of disease control.

Seed treatment

A great many chemicals have been tested during the past three seasons as possible tomato seed treatment materials. Of the total, only mercuric chloride 1-3000 and 5 per cent Ceresan 1-1200 proved to be thorough and consistent as sterilizing agents. In view of the high degree of protection given the seed against re-contamination following treatment, 5 per cent Ceresan has been adopted by most seedsmen as their regular treating material.

Field experiments have been completed in which comparative studies were made of the several materials in controlling infection by early blight. In no case was there a significant difference between any treated lot of seed when compared to the non-treated lots. This lack of disease control probably was due to the wide occurrence of the organism in all fields at the time of seeding. A failure of control of early blight through seed-treatment should not, however, be construed as a criticism of seed-treatments in general. Since there are other parasitic diseases, not native to the South, that are generally seed-borne, the practice of treating tomato seed should be rigidly adhered to.

Humidity and temperature

Work during the current year has further substantiated the close correlation between humidity and temperature relations and early blight infection. Leaf spot infection begins at a mean relative humidity of about 70 per cent and becomes progressively more pronounced until a point of almost complete saturation is reached. Field temperatures are not of as much importance as humidity, since infection can take place over the entire temperature range of tomato plant growth; however, disease-incidence was found to increase with the rise in temperature. These two factors of humidity and temperature are of considerable importance from a commercial viewpoint, since they suggest a more intensive spray schedule during periods of high humidity and that planting dates should be arranged so as to avoid periods of high temperatures during late spring.

Sprays

Extensive laboratory and field studies have demonstrated the advisability of discontinuing Bordeaux mixture as the accepted spray-material for tomato plants. When used in normal quantities, definite retardation in growth is produced during fairly dry seasons and excessive transpiration is induced at all times on seedlings. A result of the latter condition is quite often noted in northern tomato fields where many transplants fail to survive through excessive losses of plant moisture. Field studies at this station have shown that several of the neutral copper compounds have considerable possibilities as substitutes for Bordeaux mixture. While no permanent recommendations can be made at this time, the accumulated spray-data indicate that both Tri-Basic Copper (2 pounds to 50 gallons of water) and Copper Compound A (1½ pounds to 50 gallons of water) may be used with safety. Neither of these materials gave complete control of early blight but both reduced infection significantly below that of the unsprayed checks and to the same extent as Bordeaux. Tests with various spray-materials will be continued and such subsequent field changes will be recommended as may be warranted by the data collected.

Age of plants

Field observation of disease-incidence on plants of different ages, growing under comparable conditions, suggested a possible relationship between the physiology of a tomato plant and its susceptibility to infection by early blight. Subsequent controlled experiments suggest that such is the case. Accumulated data indicate that disease-incidence increases inversely as the vigor of the tomato plants decreases. Under Georgia field conditions, vigor decreases as the seedlings grow older, hence, infection may be expected to increase with the age of the plants. From the standpoint of the

commercial grower, this is of extreme importance. As another step in the reduction of field-infection, plantings should be scheduled at intervals for the different consuming areas so as to allow a full harvest of any field before the plants become hard and woody.

HARVESTING AND PACKING

During the normal process of harvesting and packing tomato plants, a certain degree of wilting is unavoidable. Disease-infection was found to increase as the period of wilting was lengthened. Repeated tests have demonstrated the importance of this phase of plant-handling. From the data collected, it appears that the commercial grower should use every precaution to hold plant-wilting to a minimum by reducing the elapsed time between pulling and packing and by using greater care in getting ample amounts of wet moss around the roots of all plants in each wrapped bundle.

OTHER INVESTIGATIONS

More local in their applications than the study of diseases of tomatoes, other investigations at the Georgia Coastal Plain Station include the following: Variety and fertilizer tests with sweet potatoes; tomato plant spacing tests; studies of tomato fertilizers; lima bean variety test, planting date, rate of seeding and fertilizer tests; study of bush and pole beans and bean diseases, and variety tests with beets and carrots.

Reference: Georgia Coastal Plain Experiment Station Report, 1939-1940, Tifton.

Wisconsin Pea Variety Trials in 1941

Trials of canning pea varieties, begun in 1937 by the Wisconsin Agricultural Experiment Station, were continued in 1941 at New Holstein, although on a somewhat smaller scale than heretofore. Planting was delayed, due to unfavorable weather conditions, and consequently the results are not as comparable between varieties as was true for the preceding four trials where it was possible to plant on consecutive dates. Dry, hot weather later in the season retarded and stunted growth of some varieties. Weather conditions also apparently favored the development of virus diseases.

The varieties tested were divided into groups as follows: Alaska-type, Early Sweet-type, Mid-season type, Perfection-type, and Early Wales-type. A mimeographed report released recently contains data on seeding and cutting dates, texture, quality rating, percentage of sieve sizes, and yields in pounds per acre.

Reference: Wisconsin Canning Pea Trials—1941. Mimeographed report from Wisconsin Agricultural Experiment Station, Madison. Copies available to members on request to the Raw Products Bureau.

Commercial Storage of Fresh Fruits and Vegetables

A recent circular presents brief summaries of the essential average storage requirements of some 25 kinds of fresh fruits, 37 vegetables, and certain other perishable commodities that enter the market on a commercial scale. The work is intended primarily for general practical reference.

Reference: The Commercial Storage of Fruits, Vegetables, and Florists' Stocks, Circ. 278, U. S. Department of Agriculture. For sale by Superintendent of Documents, Government Printing Office, Washington, D. C., 10 cents.

Massachusetts Research on Insect, Disease, and Weed-Control of Cranberries

Massachusetts is one of the few States in which cranberry growing and canning are important enterprises, and extensive research on this crop is conducted by the Massachusetts Experiment Station, with particular emphasis on insect, disease, and weed control.

Treatment for control of insects attacking cabbage, squash, and European corn borer also have been compared at this station. Breeding experiments of particular interest are those relating to tomatoes, sweet corn, and peppers, while work with asparagus has dealt largely with effect on yield of depth of planting and height of cutting.

CRANBERRY INSECTS

In experiments with cranberry weevil a Bordeaux mixture—calcium arsenate-soap spray, basic copper arsenate spray, cryolite spray and dust, and a very high grade (Kenia) pyrethrum dust have been the most effective treatments.

Cryolite—five pounds in 100 gallons of water, 400 gallons to an acre—was fully effective against the fruit worm. Dusting with a mixture of 60 pounds to an acre, also was effective. Spraying for this insect, in spite of its greater cost, is fully as advisable as dusting, for dusting seems to do more mechanical injury to the crop after the berries have begun to grow than does spraying.

As a matter of fact, the current report states that cryolite has come to stay as a cranberry insecticide, about 17,000 pounds being used on Massachusetts bogs with generally satisfactory results. It takes four or five days to effect its kill, but it stops worm feeding on foliage very soon. It is useful mainly against the fruit worm and as a substitute for lead arsenate where that has been used heretofore late in May. The weevil and the black-headed fire-worm should soon cease to be troublesome where it is used fairly regularly against the gypsy moth and false armyworm. It doesn't seem to control spanworms as well as arsenate of lead.

WEED AND DISEASE CONTROL (CRANBERRIES)

The water-white kerosenes of five different refining companies, tested for their vine-burning and weed-killing properties, were all about alike as killers of grasses, sedges, and rushes.

Studies made of relative vine burn by kerosene under varying conditions of humidity, sky, time of day, and wind showed that high relative humidities correlated with severe vine injury; kerosene applied from 11 a.m. to 4 p.m. burned the vines, while applications made the same day from 5 to 9:30 p.m. did no harm. Air currents are intimately associated in this with the prevailing humidity; if the latter is high, winds make the vine-burn excessive; if low, they hasten the evaporation of the oil, and the vines are not hurt. Kerosene always reduced the crop when applied after the blossom buds are fully developed. Applied in small quantities to the bases of the plants, kerosene kills bay-berry and sweet gale bushes as it does hoary alders. A heavy spray to the tops of these plants is equally effective.

Spray tests were run of three bogs, comparing Bordeaux with other copper fungicides. The extent to which fruit rots were controlled on the different bogs varied widely, apparently according to the density of vine growth.

Cabbage maggot control

With a field infestation moderately heavy, liquid treatments consisting of corrosive sublimate solution (1 ounce in 10 gallons of water) and calomel-gum arabic suspension (4 ounces calomel and 3¾ ounces gum arabic in 10 gallons of water) gave perfect commercial control of the maggot and produced 70 to 80 per cent large or medium-sized heads. Calomel-talc dust (4 per cent calomel), applied at the same time as the liquid treatments, was very effective and produced 80 to 90 per cent large and medium heads, being much more satisfactory than in previous seasons.

Squash vine borer

The heaviest infestation in five years occurred in Blue Hubbard squash at Waltham. Rotenone-talc dust, a spray of nicotine sulfate 1-500 plus oil emulsion 1 per cent, nicotine sulfate spray 1-250, and copper-rotenone dust, all reduced the number of borers per vine 79 per cent or more. The differences between these treatments were insignificant, but the greatest protection was obtained from the rotenone-talc dust (.75 per cent rotenone) and the spray of nicotine sulfate 1-500 plus oil emulsion 1 per cent, with 83.22 and 92.96 per cent reduction respectively.

European corn borer

Field tests of different insecticides for corn borer control were used on the variety Golden Early Market. The late season, however, delayed growth so that the plants were much smaller than usual at the time the first spray was applied and a schedule of five applications at five-day intervals was followed. Unusually cold weather occurred and the corn made very slow growth, being harvested nearly two weeks later than normal. Derris spray (4 per cent rotenone content), derris dust (1 per cent rotenone), dual-fixed nicotine dust, dual-fixed nicotine as a spray (nicotine equivalent to nicotine tannate), and commercial prepared rotenone sprays were used in the tests. Apparently one by-product of an otherwise unfavorable season was a comparatively light infestation of corn borer. Yield records showed corn in the check plots to be 85 per cent free from borers. Derris spray gave 97.8 per cent clean ears, and derris dust 96 per cent; dual-fixed nicotine as a dust gave 97.6 per cent clean ears and as a spray 96+ per cent. Only 77 per cent of the yield in the check plots, however, was of marketable grade; while in the plots treated with derris spray 89.8 per cent of the crop was marketable, with derris dust 79 per cent, with dual-fixed nicotine dust 82 per cent, and with dual-fixed nicotine spray 81.7 per cent—a very favorable comparison with unsprayed corn even in a year of light infestation. The derris spray gave a reduction of 95.5 per cent in borer population in the stalks as compared with the unsprayed checks, derris dust 92.5 per cent, dual-fixed nicotine dust 87.9 per cent, and dual-fixed nicotine spray 75 per cent.

Results of experiments made to control second generation borers, using Carmelcross, showed no value for spraying when three applications were used, the records demonstrating that more than three applications are necessary, even if they are continued nearly to harvest, since most of the infestation in the sprayed corn was from recently hatched borers. The results were further confused by a heavy infestation of corn ear worm which did not appear to be affected in any way by the sprays.

Vegetable breeding studies

Work with tomatoes includes study of the problem of incorporating the uniform ripening character into varieties which otherwise are very desirable, the main problem now being selection of lines which are stable for all characters.

Tests of strains of hybrid sweet corn showed four varieties especially noteworthy; Spancross (medium-sized ear, extra early, good quality), Marcross (few days later than Spancross, large ear, very uniform), Carmelcross (early mid-season maturity, large ear, excellent quality), and Golden Cross Bantam (especially outstanding in mid-season class, large ear, highly productive, excellent quality). Ioana, which was a few days later than Golden Cross Bantam, produced well-formed ears of fair quality, filled to the tip.

Effects of mulching tomatoes and peppers

Various mulching materials were compared with clean cultivation for tomatoes and peppers. Straw, banana fiber, and horse manure were the materials used. Based on one season's results it appears that these mulching materials had little or no effect on the yield, percentage of cracking, or quality of fruit.

Asparagus investigations

The varietal improvement studies showed that the asparagus plants derived from high-yielding parents have greatly outyielded the commercial strain of seed in the trial.

The depth of planting and height of cutting studies showed that deep planting reduced stand, mostly in the first and second years; that deep plantings were slower to produce in the spring; that asparagus crowns sought the level best suited for their needs. Cutting the spears with four inches of green did not give as high yields per plant as cutting the spears with eight inches of green, while allowing the spears to grow to 12 inches of green increased the yield slightly but reduced the number of spears. Cutting the spear with 12 inches of green did not exhaust the plant. It is recommended that crowns be planted four to six inches deep, shallower in heavier soil, and that spears be cut with seven to eight inches of green for highest returns from the asparagus bed.

Reference: Annual Report of the Massachusetts Agricultural Experiment Station for the fiscal year ending November 30, 1940, Amherst.

Raw Products Grades in Marketing Ohio Tomatoes

A new publication recording the results of 11 years of marketing Ohio tomatoes to processors on government grades and inspection has been issued. It appraises the influence of this practice on buyers and sellers and deals with grading and inspection of tomatoes at plants where these functions were performed under the supervision of the Federal-State Food Products Inspection Service in Ohio. It deals essentially, though not exclusively, with the marketing of Ohio-grown tomatoes to canners in Ohio. Data are presented also from records obtained at four stations in Michigan and two stations in Indiana when these stations were temporarily under Ohio jurisdiction.

Reference: "Marketing Ohio Tomatoes to Processors on Grades, 1930-1940." Bul. 623, Ohio Agricultural Experiment Station, Wooster.